

كيف ال Infection بتوصل المريض لل Sepsis#

نبدأ من الأول : ٤٤٤٤

مريض تعرض ل Infection من بكتريا Gram + او Gram -
او Fungi

لو العدوى كانت Gram - من المعروف ان ال Gram- بتفرز Endotoxin في الدم ٤

وال Gram + وال Fungi بتفرز chemicals تشبه ال Endotoxin

المهم بالمحصله الدم رح يكون فيه اما Endotoxin او شبيهه

هاي ال Toxin ٤٤٤٤ اللي رح تعمل Cell Destruction

واي خليه بيصيرلها destruction بتفرز Cytokines

زي ال Prostaglandin وال Leukotrin

كأنه الخليه بتبعث رساله استغاثة ويتطلب النجده من خلايا المناعه لتخلصها من ال Infection

وهاي ال Cytokine بتروح بتحفز ال Mast cell اللي بدورها رح تفرز ال Histamine وغيره من ال mediator زي ال PG وال

LT وهدول ال mediator رح يعملوا التالي :

١- هاي ال mediator بتروح ع ال Blood vessel ويتوسعه

فبيصير Vasodilatation وبتقل ال total periphral resistance

بالتالي بنتوقع يصير drop في ال Blood pressure ٤ ولما يقل الضغط بيصير Reflux Tachycardia ٤٤

والدم بيطلع من ال vessel لل Intersitial space

٢- تحفيز لل Chemotaxis effect واللي بدوره بيحفز خلايا الدم زي ال Macrophage وال neutrophils

وهاي الخلايا بتفرز TNF , IL1 , IL6 وغيرهم

ال IL1 بيحفز ال Hypothalamus لافراز ال PGE2 اللي رح يرفع الحراره ويدخل المريض ب fever ٤٤

ال IL6 وباقي ال Mediator بتروح تثبط تحويل ال Plasminogen ل Plasmin وبالتالي رح يقل ال Plasmin بالدم اللي كان

مسئول عن منع تكون الجلطات

فلما يقل ال Plasmin بتزيد فرصه تكوين ال Clot

واللي بيشجع ال Blood vessel ليصير فيه تلجطات ويعمل

Microvascular Ischemia

مش بس انو ال Plasmin تثبط بل كمان انو ال

Blood vessel Endothelium

صارلها Injury من ال Inflammatory mediator

وطلع ال Tissue Factor اللي رح يمشي بمسار ال Clot formation

وبهيك بيصير تجلطات داخل ال Vessel فبيققل وصول الدم للاعضاء

VISIT...

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يُصير لها Hypoxia و necrosis ويمكن توصل ل Organ Failure وأكثر عضو ما يستحمل قلة الدم هي ست الكل ال Kideny

طبعاً لما يصير Hypoxia مش رح تسكت الأعضاء ورح تدور لها على مسار ثاني تطلع منه طاقة ATP وتنقذ ما يمكن انقاذه

ف ال Organs رح تمشي بمسار ال anerobic لتكوين طاقة وبينتج عن هاد المسار Lactic Acid ..

هيك باختصار الميكنازم لوصل العيان من Infection ل Sepsis

فلو شفتنا تعريف ال Sepsis حسب ال Sepsis 2 Guideline

□: □Sepsis is probable or Documented Infection with equal or more than 2 SIRS criteria
يعني المريض يكون عنده Infection وعلامتين او اكثر من SIRS

SIRS criteria

1□Temperature > 38°C or < 36°C

2□Heart rate > 90/minute

3□Respiratory rate > 20/minute (or PaCO₂ < 32 mmHg)

4□WBC > 12,000/μL or < 4,000/μL (or > 10% immature bands)

فلو المريض عنده Infection وعلامتين او اكثر من ال SIRS بنسميه Septic patient

رجعو جماعة ال sepsi 2 Guideline ضافو كمان تعريفين

اللي هما ال

□ Sever sepsis □ Septic shock

□Sever sepsis : sepsis+ organ hypoperfusion or organ dysfunction

يعني مريض دخل فعلياً ب sepsis ودخل ب Organ failure

يعني مثلاً oligurea وال Srcr عمال بيرتفع معناته ال

Kideny hypoperfusion

لو صار عنده Acute Respiratory distress syndrome

او لو صار عنده Hemodynamic problem

معناته المريض دخل ب Sever sepsis

□ Septic shock : sepsis + Refractory hypotension despite Fluid resuscitation (30 ml/kg) or serum lactate > 1 mmol/L

يعني المريض sepsis وضغطه واقع ومش مستجيب لل fluid

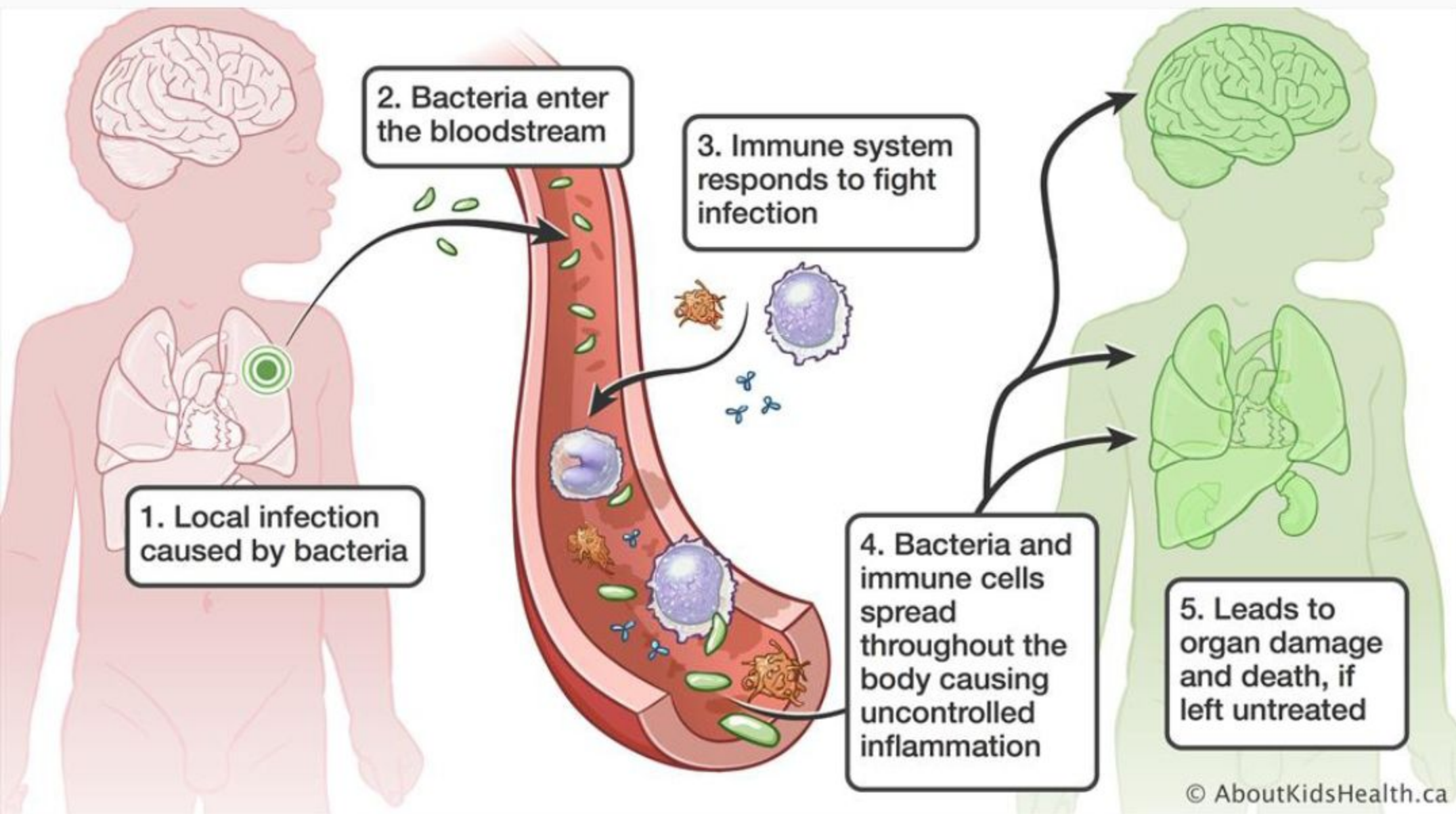
او ال lactate في الدم اكثر من 1 mmol لكل لتر

هاد الكلام كله لحد اواخر 2015 وكان sepsis 2 guideline هو الدارج

ب 2016 طلع Sepsis 3 guideline واللي اعتمد ع Sofa score

اللي رح نشرحه بالبوست القادم ان شاء الله ٤٤

#لعللي أفيدك ٤



Simple
infection

Sepsis

Severe
sepsis

Septic
shock

Sepsis-2

≥ 2 SIRS criteria:

- Fever/hypothermia
- Tachycardia
- Tachypnea
- Leukocytosis/
leukopenia

Sepsis with:

- Organ failure
- or Hypotension
- or Hypoperfusion

Refractory
hypotension

Septic

Sepsis-2

Hemodynamic variables

Arterial hypotension (systolic < 90 mmHg, MAP < 70 mmHg, or systolic reduction > 40 mmHg in adults or < 2 SD of the normal value for age)

SvO₂ $< 70\%$

Cardiac index > 3.5 L/min/m²

Indicators of organ dysfunction

Arterial hypoxemia (PaO₂/FiO₂ < 300)

Abnormal state of consciousness

Acute oliguria (urine output < 0.5 mL/kg/hour)

Elevated creatinine > 0.5 mg/dL

Coagulation disorders (INR > 1.5 /aPTT > 60 s)

Thrombocytopenia ($< 100,000/\mu\text{L}$)

Hyperbilirubinemia (> 4 mg/dL or 70 mmol/L)

Indicators of tissue perfusion

Hyperlactatemia (> 1 mmol/L)

Reduced capillary refill and mottled skin

تكلما بالبوست السابق عن ال sepsis 2 guideline

واللي وصلنا منه لتعريف ال SePsis على انه وجود Infection + SIRS وعرفنا شو هي ال SIRS

وأن ال Sever sepsis بيكون المريض دخل ب Organ dysfunction

أما ال septic shock ف اتفقو على أنها وجود Sepsis والمريض لساته Hypotensive (ال Systolic أقل من 90 أو ال MAP أقل من 70) ولا يستجيب لل Fluid Resuscitation

او المريض sepsis وال serum lactate اكثر من 1mmol/L

وضلت هاي التعريفات لحد ظهور Sepsis 3 guideline سنة ال 2016

اللي اعتمد ع score سموه

SOFA (Sequential organ fauler assessment)

اللي عرّف ال Sepsis كالتالي :

Sepsis: Life threatening organ dysfunction caused by a desregulated host response to Infection
(Acute change in sofa score ≥ 2 point)

يبقى عشان نحكي عن المريض انه Septic pateint

لازم يكون عنده Infection دخلته ب Organ fauler وحسبنا ال

SOFA score

وكان اكبر او يساوي 2

طيب على شو بيعتمد ال SOFA score (موجود في تطبيق Genebrandex)

بيعتمد على قياس ال

Lung Coagulation Liver Cardiovascular Brain Kidney function

Lung: Respiration

بنقيس فيه ال PaO₂/FIO₂

(PaO₂ (arterial pO₂) from the ABG.

(FIO₂ - the fraction (percent) the percentage or concentration of oxygen that a person inhales

ومن خلال قيمه ال Pao₂/FIO₂ بنحدد ال Lung Point

1 PaO₂/FIO₂ >400 (0 points)

2 PaO₂/FIO₂ 301 to 400 (1 point)

3 PaO₂/FIO₂ ≤ 300 (2 points)

4□PaO₂/FIO₂ 101 to 200 with ventilatory support (3 points)

5□PaO₂/FIO₂ ≤100 with ventilatory support (4 points)

□Coagulation: Platelets

1□>150 x10³/mm³ (0 points)

2□101 to 150 x10³/mm³ (1 point)

3□51 to 100 x10³/mm³ (2 points)

4□ 21 to 50 x10³/mm³ (3 points)

5□≤20 x10³/mm³ (4 points)

□Liver: Bilirubin

1□<1.2 mg/dL (20 μmol/L) (0 points)

2□1.2 to 1.9 mg/dL (20 to 32 μmol/L) (1 point)

3□2 to 5.9 mg/dL (33 to 101 μmol/L) (2 points)

4□6 to 11.9 mg/dL (102 to 204 μmol/L) (3 points)

5□>12 mg/dL (>204 μmol/L) (4 points)

□Cardiovascular: Blood Pressure

1□ Hypotension absent (0 points)

2□Mean arterial pressure <70 mmHg (1 point)

3□On Dopamine ≤5 mcg/kg/min or any Dobutamine (2 points)

4□On Dopamine >5 mcg/kg/min, Epinephrine ≤0.1 mcg/kg/min or Norepinephrine ≤0.1 mcg/kg/min (3 points)

5□On Dopamine >15 mcg/kg/min or Epinephrine >0.1 mcg/kg/min or Norepinephrine >0.1 mcg/kg/min (4 points)

□□Brain: Glasgow Coma Score

Genebrandex □ طريقه حسابه مرفق بصوره مبسطه وموجود في تطبيق

1□15 (0 points)

2□13 to 14 (1 point)

3□10 to 12 (2 points)

4□6 to 9 (3 points)

5□ <6 (4 points)

□Kidney: Renal Function

1□Creatinine <1.2 mg/dL (110 mcmol/L) (0 points)

2□Creatinine 1.2 to 1.9 mg/dL (110 to 170 mcmol/L) (1 point)

3□ Creatinine 2 to 3.4 mg/dL (171 to 299 mcmol/L) (2 points)

4□ Creatinine 3.5 to 4.9 mg/dL (300 to 440 mcmol/L) or urine output 200 to 500 mL/day (3 points)

(5□Creatinine >5 mg/dL (440 mcmol/L) or urine output <200 mL/day (4 points)

وبنجم النقاط ،لو كانت اكبر من او يساوي 2 مع وجود Infection و Organ dysfunction معناته المريض Septic

طبيب متى بنقول ان المريض دخل ب Septic shock

حسب ال Sepsis 3 guideline

Septic shock : Sepsis + persistent hypotension require vasopressor use And serum lactate >2 mmol /L despite adequate fluid resuscitation

يعني لو كان المريض عنده Infection وال SOFA score >= 2

والمريض Hypotensive (ال Systolic أقل من 90 أو ال MAP أقل من 70) وما بيستجيب لل Fluid

ورح يحتاج Vasopressor لرفع ضغطه

وعنده ال Serum lactate اكثر من 2mmol/L

بهباله المريض عنده Septic Shock

البوست القادم ان شاء الله رح نتكلم عن علاج ال Septic shock

#لعلي_أفيدك ٤

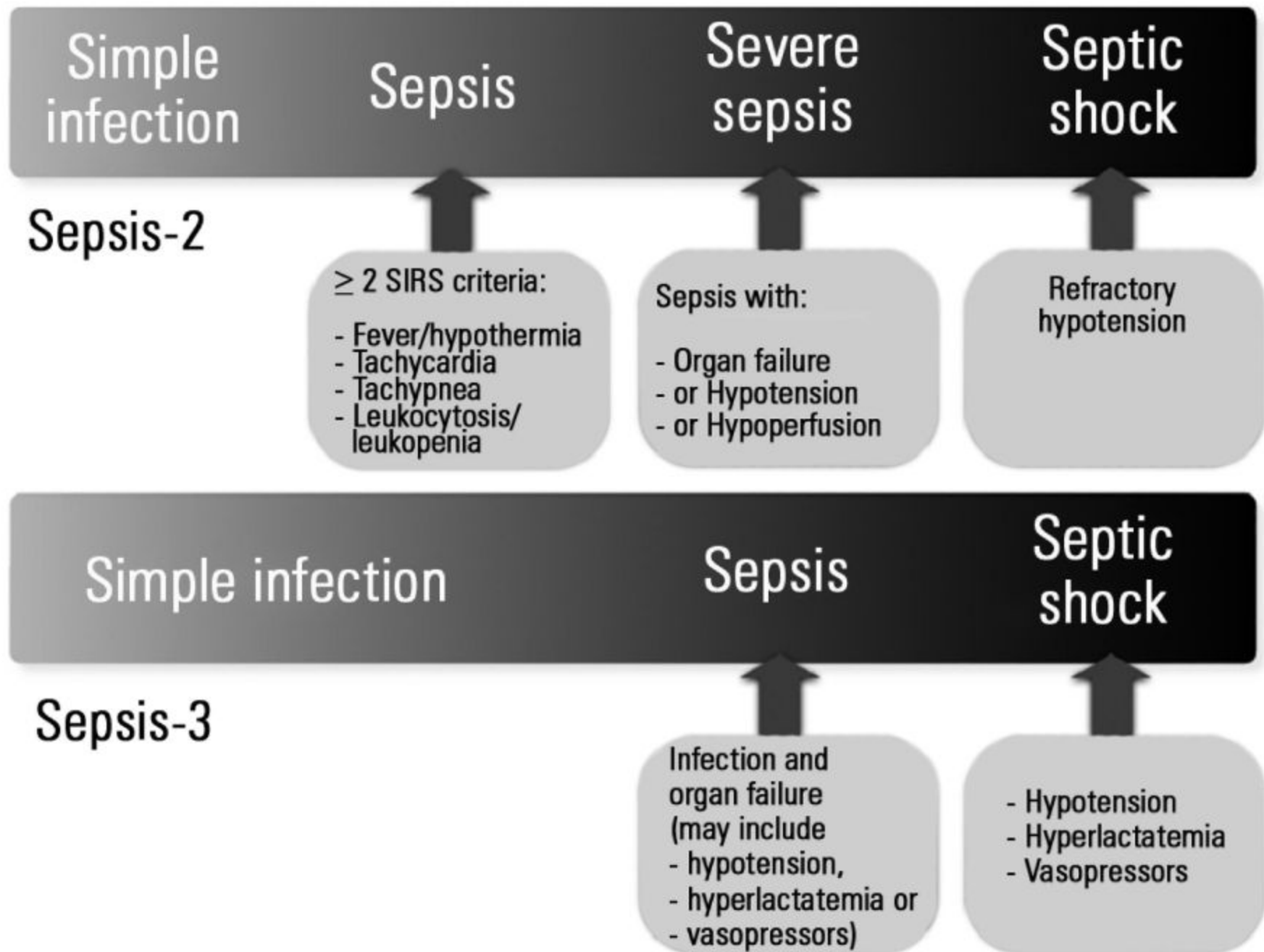


Table 2 Sequential Organ Failure Assessment (SOFA) score⁽⁴⁾

Score	1	2	3	4
Respiratory system (PaO ₂ /FiO ₂ - mmHg)	< 400	< 300	< 200 (and ventilation support)	< 100 (and ventilation support)
Coagulation (platelets x 10 ³ /mm ³)	< 150	< 100	< 50	< 20
Liver (bilirubin - mg/dL)	1.2 - 1.9	2.0 - 5.9	6.0 - 11.9	> 12.0
Cardiovascular system (arterial hypotension)*	MAP < 70mmHg	Dopamine ≤ 5 or dobutamine (any dose)	Dopamine > 5 or epinephrine ≤ 0.1 or norepinephrine ≤ 0.1	Dopamine > 15 or epinephrine > 0.1. or norepinephrine > 0.1
Central nervous system (Glasgow Coma Scale)	13 - 14	10 - 12	6 - 9	< 6
Kidneys (creatinine - mg/dL) or urine output - mL/day	1.2 - 1.9	2.0 - 3.4	3.5 - 4.9 or < 500mL/day	> 5.0 or < 200mL/day

Table 3 Sepsis-3 criteria

qSOFA	Septic shock
Respiratory rate ≥ 22 /minute Systolic arterial pressure ≤ 100 mmHg Altered mentation	Arterial hypotension requiring vasopressors to maintain mean arterial pressure ≥ 65 mmHg and hyperlactatemia > 18 mg/dL (2mmol/L) despite adequate vascular filling

qSOFA - quick Sequential Organ Failure Assessment.

Glasgow Coma Scale

EYE OPENING		VERBAL RESPONSE		MOTOR RESPONSE	
					
Spontaneous	> 4	Orientated	> 5	Obey commands	> 6
To sound	> 3	Confused	> 4	Localising	> 5
To pressure	> 2	Words	> 3	Normal flexion	> 4
None	> 1	Sounds	> 2	Abnormal flexion	> 3
		None	> 1	Extension	> 2
				None	> 1

GLASGOW COMA SCALE SCORE

Mild
13-15

Moderate
9-12

Severe
3-8

يسعد مساكم ٤٤

تكلما السنه الماضيه ٤٤ عن ال

Sepsis 2&3 guideline

وشفنا الفرق بينهم وال Scores المستخدم في تشخيص ال Sepsis

ووصلنا لانه احدث Score هو ال SOFA score ... □

اليوم ان شاء الله رح ندخل بال □□□ management

□ General Managment of Sepsis & Septic Shock□

1□- Fluid Therapy : Initial resuscitation of Fluid within 1 hour at a dose 30ml/kg to all sepsis pateint with no exception

2□-Broad spectrum Antibiotic

اول ما نشخص المريض بنبدأ بال Fluid مع ال Antibiotic

طيب لو لسه المريض ما بيستجيب ولساته Hypotensive

او ال Lactate لساته عالي ف بندخل على □

Vasopressor -3□

لو لسه ما في Response بنعطي □

Corticosteroids-4□

يعني اول شي رح اعطي Fluid مع مضادات حيويه

لو لسه ال Response مش مظبوط بعطي Vasopressor

و لو لسه ال Response ضعيف بضيف Corticosteroid

5□- Glucose Monitor

وبننظم السكر

6□- Venothromboembolic (VTE) prophylaxis

7□- Stress Ulcer Prophylaxis

هاي السبع نقاط هي الخطوات اللي رح امشي فيهم لمرضى ال Sepsis

هدول السبع نقاط طلع منهم كتير Guidelines رح نتكلم عن اشهر اتنين

(□ SSC 2015 Guideline (Old) and SSC 2018 Guideline (New

ال Guideline 2015 هو ال Guide القديم

وبنسماه

3hour Bundle to complete within 6 hour

يعني خلال اول ثلاث ساعات من تشخيص ال Sepsis
لازم اكون عملت مجموعه من ال bundle (Role)
واكمل لحد 6 hour

تعالو نشوف هاي ال bundle

The 3-hour recommendations, which must be carried out within 3 hours from the first time sepsis is suspected:

فأول ثلاث ساعات لازم اعمال الاربع نقاط التاليه :

1) obtain a blood culture before antibiotics
اول شي نسحب للمريض Blood culture

2) obtain a lactate level
ونقيس ال blood lactate

3) administer broad-spectrum antibiotics

4) administer 30 mL/kg of crystalloid fluid for hypotension (defined as a mean arterial pressure ((MAP) < 65) or lactate (> 4
ونبدأ باعطاء Fluid بجرعه 30ml/kg من ال Ringer lactate او ال Normal saline

وبعدها في اشياء رح اكملها ٤
TO BE COMPLETED WITHIN 6 HRS.

5. Apply vasopressors (for hypotension that does not respond to fluid resuscitation) to maintain a mean arterial pressure (MAP) $\geq$ 65 mmHg
فلو ما استجاب المريض بعد ال 3hour fluid bolus بنعطي Vasopressor

6. In the event of persistent arterial hypotension after initial fluid administration (MAP < 65 mm Hg) or if the initial lactate was $\geq$ 4mmol/L, re-assess volume status and tissue perfusion
وبنرجع نعمل Assessment لل Fluid زي ما رح نشوف لاحقا

7. Re-measure lactate if initial lactate was elevated
ونرجع نعمل assessment لل Lactate

٤ اما SSC 2018 Guideline وهو الاحداث والمعتمد حاليا

اعتمد ع 1hour bundle

يعني خلال اول ساعه من تشخيص ال Sepsis رح نعمل المجموعه التاليه من ال : Bundle

1-Measure lactate level

2-Obtain blood cultures before administering antibiotics.

3-Administer broad-spectrum antibiotics.

4-Begin rapid administration of 30mL/kg crystalloid for hypotension or lactate level ≥ 4 mmol/L.

5-Apply vasopressors if hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg.

(* Remeasure lactate if initial lactate is elevated (> 2 mmol/L).

فالفرق انه ب 1 hour bundle

رح نعطي ال Fluid ال 30 ml/kg خلال اول ساعه من تشخيص ال Sepsis ووجدو انه اعطاء ال FLuid خلال ساعه واحده أفضل من اعطاءه خلال ٣ ساعات

يعني لو مريض وزنه 70kg رح ياخذ 2L تقريبا خلال ساعه

يعني كل 15 دقيقه بعطي 500 ml وبقيم حاله المريض بعد كل 500 ml

لو بيستجيب بكمل لحد ما اخلص ال 30ml/kg خلال الساعه

لو ما بيستجيب بعطي Vasopressoe ولو ما استجاب بضيف corticosteroid

وهو ال Guide الاحداث والافضل ٤

هيك بنكون اخدنا المجلد من ال Managment

البوست القادم ان شاء الله رح نفصل ال Fluid وكيف اعطيها وكيف أعمل تقييم Assessment للمريض واعرف انه فعلا بيستجيب

ولمتى هكمل Fluid مع المريض ٤

#لعلي أفيدك ٤٤



Time interval from time of presentation: 1 hour.

TIME OF PRESENTATION

Suspected infection + SOFA ≥ 2

SEPSIS 1

SAY sepsis
LOOK FOR the source
CONSIDER imaging studies
ATTACH the monitor
OBTAIN cultures (with at least 2 blood cultures), A-V gas analysis w/lactate, blood samples and consider measuring procalcitonin

ENSURE appropriate IV broad-spectrum antibiotics(s) administration (consider time-to-needle: 1 hr)^b

• Full-loading dose even if decreased GFR is suspected

CONTROL sepsis source as soon as possible: surgery or percutaneous drainage for drainable foci 2



Sepsis WITHOUT hypotension algorithm 3

NO

Hypotension
(map <65 mmHg)
OR
lactate ≥ 4 mmol/L

YES

Sepsis AND hypotension algorithm 4

REMEASURE lactate if > 2 mmol/L

START resuscitation with IV fluids 5
(30 ml/kg of crystalloids)
REMEASURE lactate if > 2 mmol/L

ASSESS continuously: 8

- Vital signs
- Diuresis (<0.5 ml/kg/h)
- Lactate, SvO₂ and Δ PCO₂
- Capillary refill time/skin
- Mental status
- Oxygenation
- 3P: MAP/SAP/DAP

ADJUST antibiotic therapy according to initial microbiology and expert consultation.

OPTIMIZE antimicrobial doses and think about the duration of therapy^b

REMOVE intravascular access devices that could be possible sources after other IV access have been established

REGISTER all interventions and clinical variables

ANTICIPATE echocardiogram and central IV access
FOLLOW protocolized early sepsis care bundles at your institution
REASSESS continuously AND RULE out additional causes of shock

NO

MAP <65 mmHg (during or after initial fluid resuscitation) and lactate > 2 mmol/L (in the absence of hypovolemia) 6

YES

SEPTIC SHOCK 7

START norepinephrine at 0.01 mcg/kg/min and titrate every 3-5 min or dopamine (if relative bradycardia with low-risk for arrhythmias is present) to achieve MAP ≥ 65 mmHg in most patients. ASSESS valid and available dynamic predictive variables of volume response and consider fluid challenge
Intensivist consultation for ICU admission

MAP <65 mmHg (during or after initial fluid resuscitation) and lactate > 2 mmol/L (in the absence of hypovolemia) 6

START resuscitation with IV fluids (30 ml/kg of crystalloids)



To be
completed
withing
3 hours

- 1 Measure lactate level
- 2 Obtain blood cultures prior to administration of antibiotics
- 3 Administer broad spectrum antibiotics
- 4 Administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L



To be
completed
withing
6 hours

- 5 Apply vasopressors (for hypotension that does not respond to initial fluid resuscitation) to maintain a mean arterial pressure (MAP) ≥ 65 mm Hg
- 6 In the event of persistent hypotension after initial fluid administration (MAP < 65 mm Hg) or if initial lactate was ≥ 4 mmol/L, re-assess volume status and tissue perfusion and document findings according to Table 1
- 7 Remeasure lactate if initial lactate elevated



Initial resuscitation for sepsis and septic shock (begin immediately)

- 1 Measure lactate level*
- 2 Obtain blood cultures before administering antibiotics
- 3 Administer broad-spectrum antibiotics
- 4 Begin to rapidly administer 30mL/kg crystalloid for hypotension or lactate ≥ 4 mmol/L
- 5 Apply vasopressors if hypotensive during or after fluid resuscitation to maintain a mean arterial pressure ≥ 65 mm Hg

*Remeasure lactate if initial lactate elevated (>2 mmol/L)

تكلما بالبوست السابق عن ال
.....General management of sepsis & Shock
اليوم ان شاء الله رح نبدأ بتفصيل ال Management

ورح نتكلم عن ال Fluid Resuscitation وهنعتمد على أحدث Guideline الي هو ال
1 hour Bundle

اللي اعتمدت على اعطاء 30ml/kg at the First Hour

شو هي أنواع ال Fluid اللي بقدر استخدمها لل Resuscitation
حسب ال Recommendation وجدوا أن ال Crystalloid زي ال Normal saline وال Ringer Lactate وال Colloid زي
Albumin ال

إلهم نفس الكفاءة لل Resuscitation
لكن Ringer lactate هو الأفضل
لانه ال Normal saline ممكن بالكميات الكبيره يدخل المريض ب
Hyperchloremic Metabolic acidosis
وال Albumin اله cost عالي ومش دائماً متوفر
وبلجاً إله لو المريض رح يحتاج كميات كبيره من ال Fluid

فأفضل Fluid بقدر استخدمه هو ال Ringer lactate

وممنوع استخدام ال pentastarch or hydroxyethyl starch

طيب شو الهدف من ال Fluid resuscitation بال Sepsis

بما انه المريض Hypotensive فلازم نعطي Fluid لمنع ال organ Failure وعشان أحافظ على ال (Mean arterial pressure (MAP اكثر من 65mmhg

بس لازم ناخذ قاعده مهمه جداً :

Consider Fluids are Drug which must be neither overdose nor underdose

يعني رح أعطي ال Fluid حسب الحاجه

لانه لو اعطيت بزيادة ،رح يصير عند المريض Edema

خاصة Pulmonary Edema وممكن يدخل ب ARD

و Anuria و Organ failure

ف زيادة ال Fluid مش غنيمة

ففكرة اني اعمل Aggressive Resuscitation مرفوضه ورح تضر العيان وتزيد ال Mortality Risk

طبيب كيف رح نعطي ال Fluid

رح نعطي ع أربع خطوات مجموعه بكلمه ROSE

1 Resuscitation (within the first hour)

2-optimization (within hours)

3-Stabilization (within days)

(4-Evacuation (Within days to week

مريض Sepsis وزنه 70 kg

اول ما يتشخص بأول ساعه رح نبدأ بخطوه ال Resuscitation

بال fluid ونعطي Antibiotic

فال Fluid رح نعطي 30ml/kg خلال اول ساعه

فلو وزنه 70 kg رح ياخذ 2L تقريبا ،بأول ساعه

طبيب كيف بنوزعهم؟

لو رح ياخذ مثلا 2L

كل 15 دقيقه بنعطي bolus 500ml من ال Fluid

وبعد ال Bolus بنعمل Assessment للمريض لو المريض بيستجيب بنكمل

يبقى بعد كل bolus بنعمل Assessment

لو بيستجيب المريض بنكمل معه

لو ما بيستجيب بنحوله على vasopressor, زي ال Noradrenaline وما بنعطي fluid bolus

بل لو كان hypovolemia بعطيه fluid maintenance وممكن لهلحاله أفضل ال colloid خصوصا لو كان

hypalbuminemia

في بعض ال clinicals بيعملو Assessment بعد ما يعطو كل ال 30ml/kg/1hour وبعدها بيقرر هل المريض رح يحتاج

كمان وهل بيستجيب أو لا

طبيب كيف رح نعمل Assessment للمريض

في عنا طريقتين لل Assessment

Static (less accurate)

Dynamic (more accurate)

وزي ما اتفقنا رح نعمل Assessment بعد كل bolus المريض بياخذها

يعني مثلا لو كل 15 min رح ياخذ 500 ml بتابع المريض قبل وبعد كل bolus لاشوف هل في Response

هل اكمل ع ال Fluid ولا لا

ال Static method وهي مش Accurate وضعيفه والافضل عدم استخدامها لتقييم هل الحاله رح تستمر ع fluid ولا لا

ال Static زي متابعه احدى ال parameter التاليه .

(HR (Heart Rate -1

لو قل ال HR يعني المريض عماله بيستجيب لانه لما يكون المريض Hypotensive ال HR بيزيد بال Reflux tachycardia

2- CVP (Central Venous Pressure) Normal value 8-12 mmhg

بقيسو الضغط بال venous اللي يتصب بالقلب

Inferior&superior Vena cava

الضغط بهادي الاورده بتعبر عن قديش في دم رح يدخل ع القلب

(ال preload)

وكل ما زاد ال preload بيزيد ال Strock Volume (الدم الخارج من القلب) وكل ما زاد ال SV بيزيد ال Cardiac output

ولما يزيد ال CO بيزيد ال Blood pressure وبيتحسن ضغط المريض

($Bp = CO * Periphral\ resistance$)

يعني بالمختصر لو المريض استجاب لل Fluid رح يزيد ال volume اللي رح يدخل القلب ورح يزيد ال volume اللي رح ينضخ

من القلب

وهاد معناها انه المريض استجاب لل Fluid

لكن وجدوا ان ال CVP مش دقيق فمثلا ممكن مريض يكون ال CVP تبعه يكون حوالين ال Normal لكنه غير متحسن على ال

Fluid

In practise CVP should not be used to predict or guide Fluid resuscitation but may be used for safety endpoint if available

3- Urine output to be $>0.5\text{ ml/kg/hr}$

(4-ScvO₂ ≥ 70 percent (≥ 65 percent if sample is drawn off a PAC

اما ٤ ال Dynamic method فهي دقيقه والافضل الاعتماد عليها بال Fluid responsiveness assessment

لأنها بتعتمد mainly على ال Strock volume من امثله الطرق اللي بتقدر تعبر عن ال dynamic method

1- Inferior vena cava (IVC) distensibility & Collapsability

ولازم يكون المريض ع mechanical ventilator

بقيسو ال diameter لل IVC خلال الشهيق والزفير ويتابعو تغير ال diameter ويحسبوها بمعادله

لو طلعت القيمه 13-15% معناها المريض بيستجيب ع ال fluid لو كانت اقل معناها ما بيستجيب

3- Pulse pressure variation

4- Systolic pressure variation

5- Strock volume variation

6- Leg Reaise challenge

بوضعيه محدده للمريض بياخدو قراءه لل strock volume وبعدها بيرفعو رجلين المريض بزاويه 45° فالدم بيروح من الرجلين

للقلب

كأنه bolus ودخل ع القلب

فلو زاد ال strock volume من 10-15% معناها المريض بيستجيب لل Fluid

نرجع نرتب الامور:

مريض Sepsis وزنه 70 kg ورح نمشي ع 1 hour bundle

خلال اول ساعه رح نعطيه 30ml/kg من ال Ringer lactate

فبحتاج تقريبا لترين

كل 15 دقيقة بنعطيه 500 ml وبعد كل 500 ml بنعمل assessment باحدى ال Dynamic Method
طبيب فرضا اعطينا اول 500 وعملنا ال Assessment لقينا في تحسن ،بعطي ال Bolus الثانيه وبعدها بعمل Assessment
وهكذا

طبيب فرضا ما كان في response لل Fluid
ساعتها بوقف ال fluid resuscitation ويدخل على vasopressors وليكن noradrenaline
لان بهلحاله لو كملت وضايبت اعطي Fluid بكميات كبيره وهو بالاصل ما بيستجيب المريض
رح يصير للمريض edema ويدخل ب Pulmonary edema و anuria و organ failure و يزيد ال Mortality risk
ف ممكن اكتفي بس بال maintenance fluid ومراقبه المريض جيدا

يعني شو اللي بيخليني اكمل اعطاء Fluid ?
1- patient with circulatory failure as sepsis patient
2- He response to fluid by assessment
3- Benefit from using fluid more than Risk
يعني رح يستفيد وال Risk انه يدخل ب edema قليل

وشو اللي بيخليني أوقف اعطاء ال Fluid
• Recommended resuscitation end-points are:
o MAP > 65 mmHg
o Normalization of the lactate
o Dynamic measurement indicates patient is no longer fluid responsive

طبيب المريض اللي بيستجيب بعد ما اعطيته ال 30ml/kg
ولسه بده كمان Fluid ليوصل لل target من ال Blood pressure

طبيب كيف رح اكمل معه؟
Note □ Additional fluids should be guided by frequent reassessment of hemodynamic status. □
• Recommended measurements include MAP, BP, HR, urine output, capillary refill, cardiac
ultrasound, ScvO₂, lactate clearance

بنمشي ع ROSE
1-Resuscitation □ (30 ml/kg/1hr)
2-Optimization (hours after resuscitation)
3-Stabilization (days)
(4-Evacuation (days to weeks

ال Optimization هدفنا نخلي في neutral fluid balance
بين اللي بياخده المريض input (من شرب و IV fluid) وبين ال Output
وبعمل monitor كويس

ال stabilization
The focus should be on organ support and keeping fluid balance neutral to net negative

وغالبا بيمشي المريض ع maintainanc dose
30 ml / kg/day of fluid only

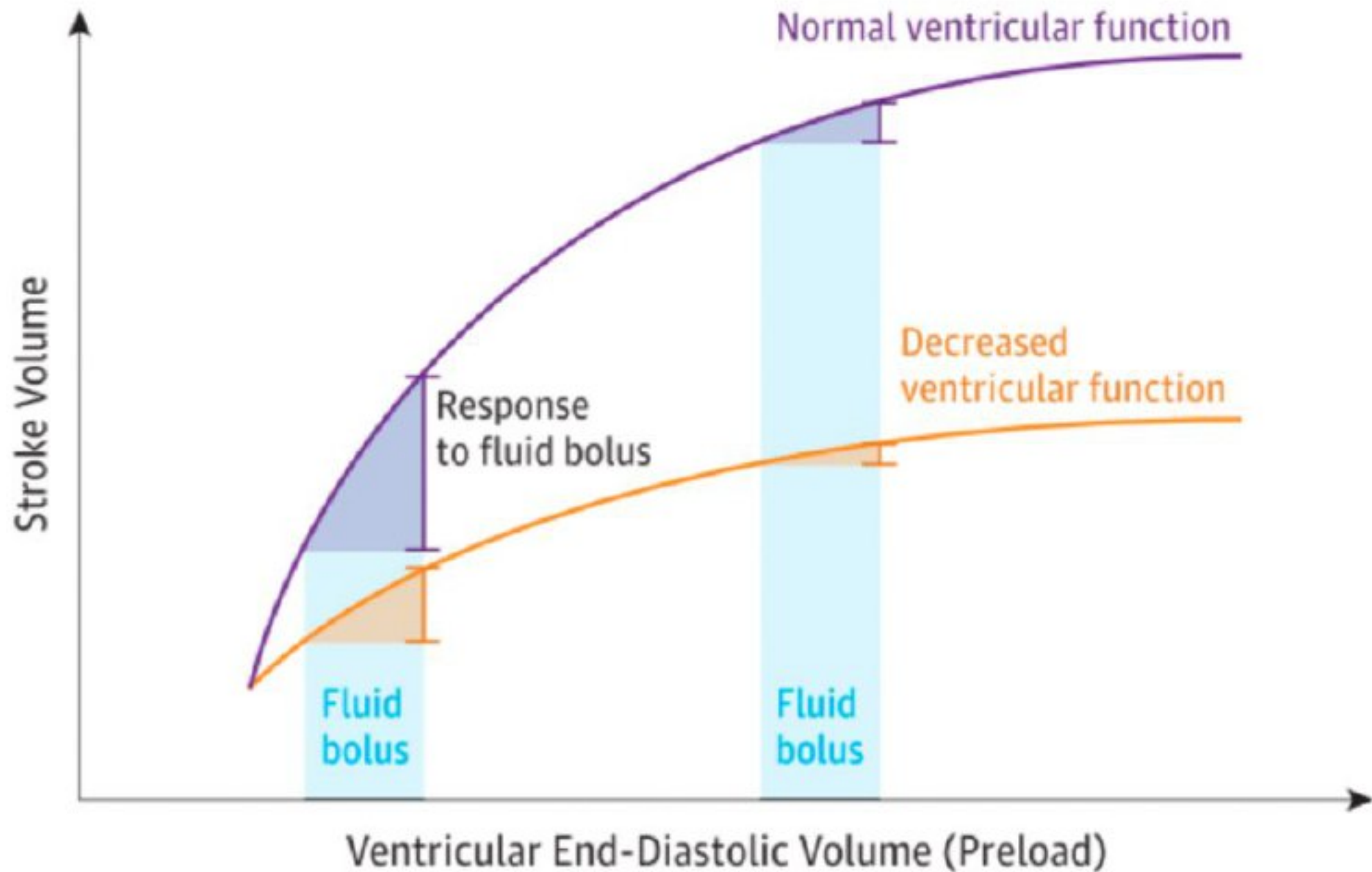
آخر شي ال Evacuation
(Keep fluid balance negative (Output >his intake
وبنوقف ال fluid وبتتابع المريض كويس عشان م يرجع hypotensive

طبيب لو كان المريض اللي جاي ب Sepsis مريض Heart fauiler
هل رح اعطيه ال 30ml/kg/within 1 hour

بغض النظر عن ال Pateint history اول ما يتشخص المريض ب sepsis رح يمشي ع القاعده 30 ml/kg بدون استثناءات
بس لانه heart fauiler لازم اعمله متابعه كويسه وراقب ال respiration لو حسيت انه صار عنده مشكله وهيدخل ب
Pulmonary edema بوقف عنه ال Fluid ويعطيه Vasopresor

تم بحمد الله
البوست القادم ان شاء الله رح يكون عن ال Emperical Antibiotic

#لعلي_أفيدك ٤



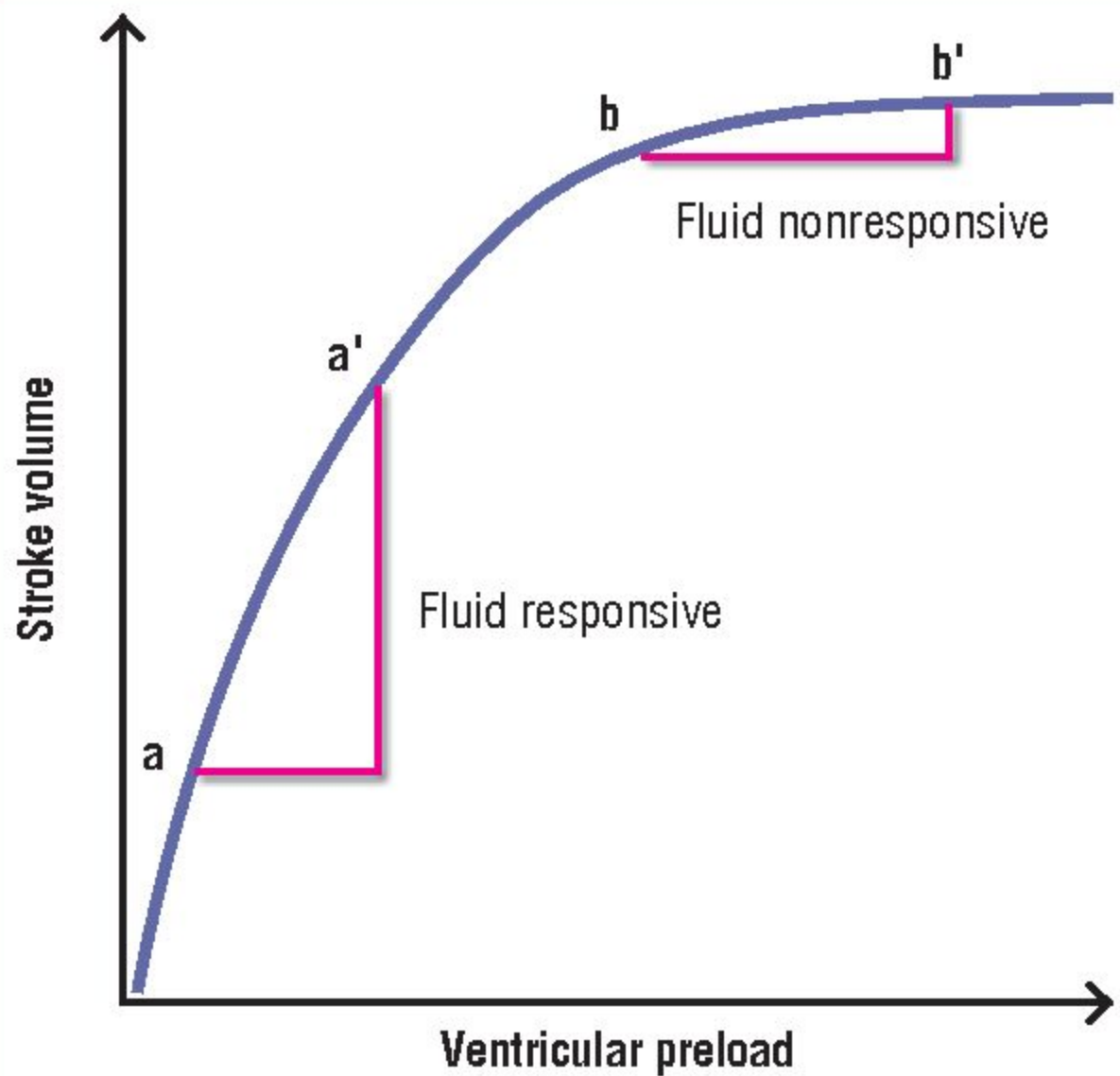
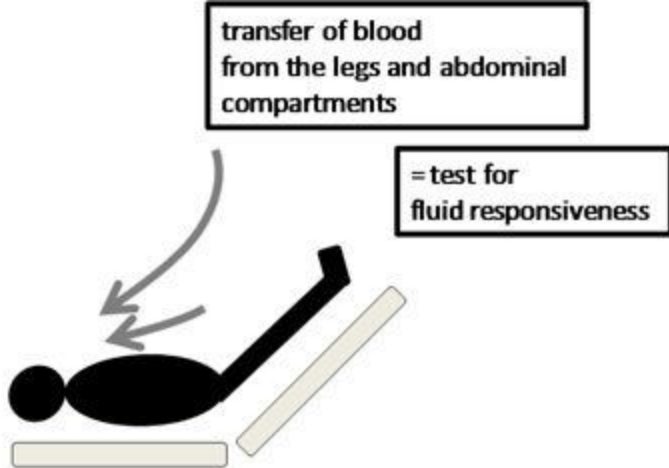


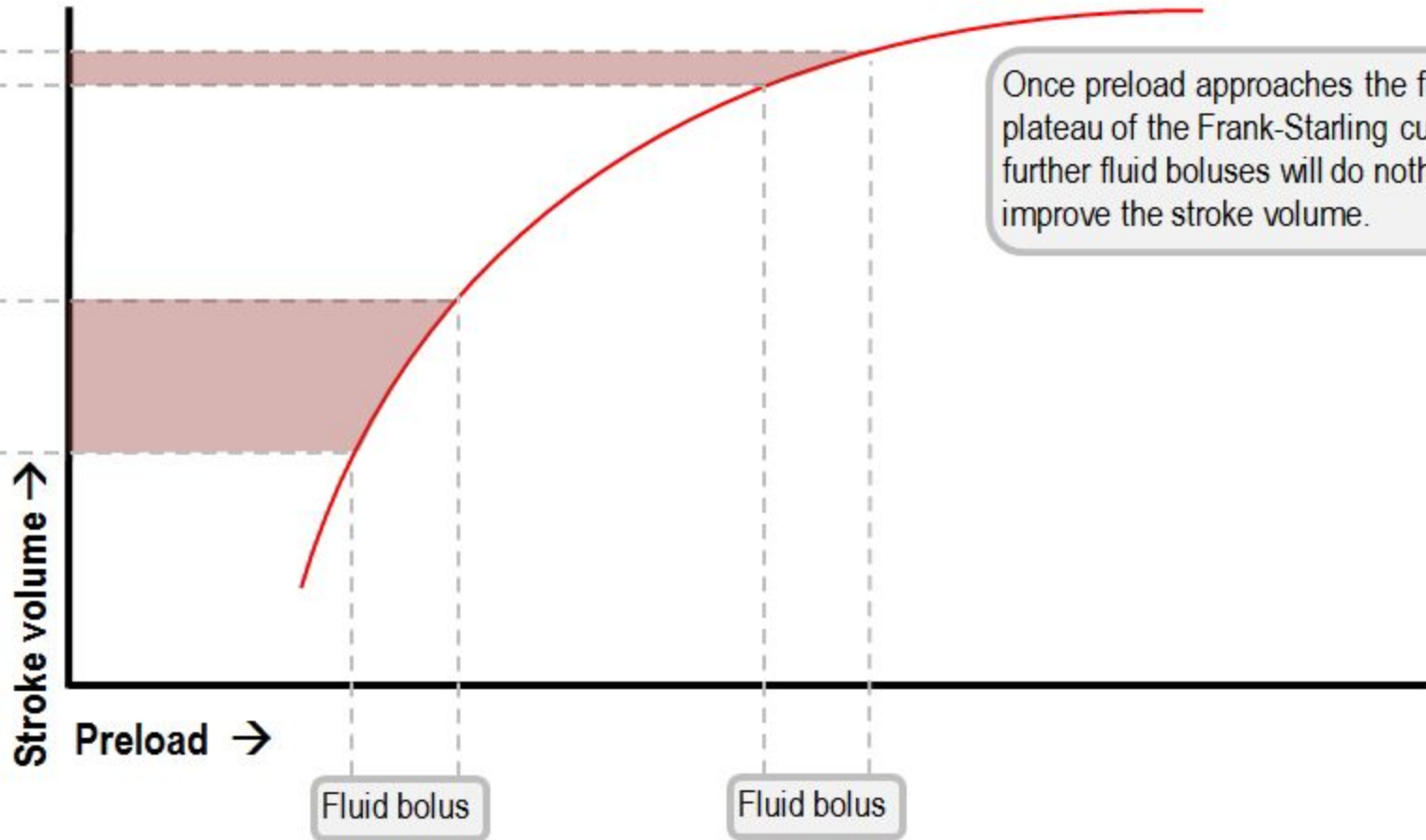
Figure 1 Frank-Starling curve shows relationship between



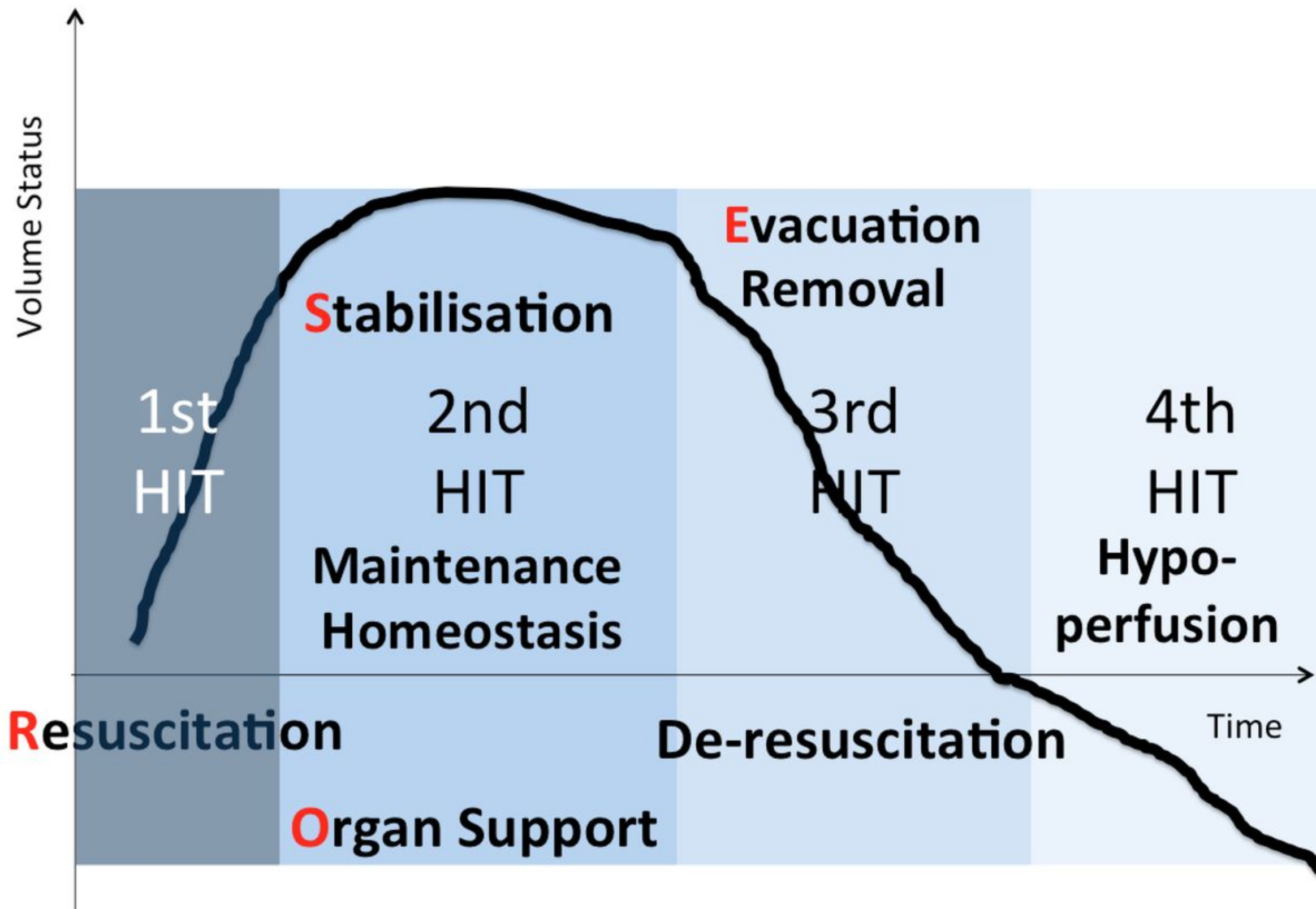
passive leg raising

Feeble response to a fluid bolus

Vigorous response
to a fluid bolus



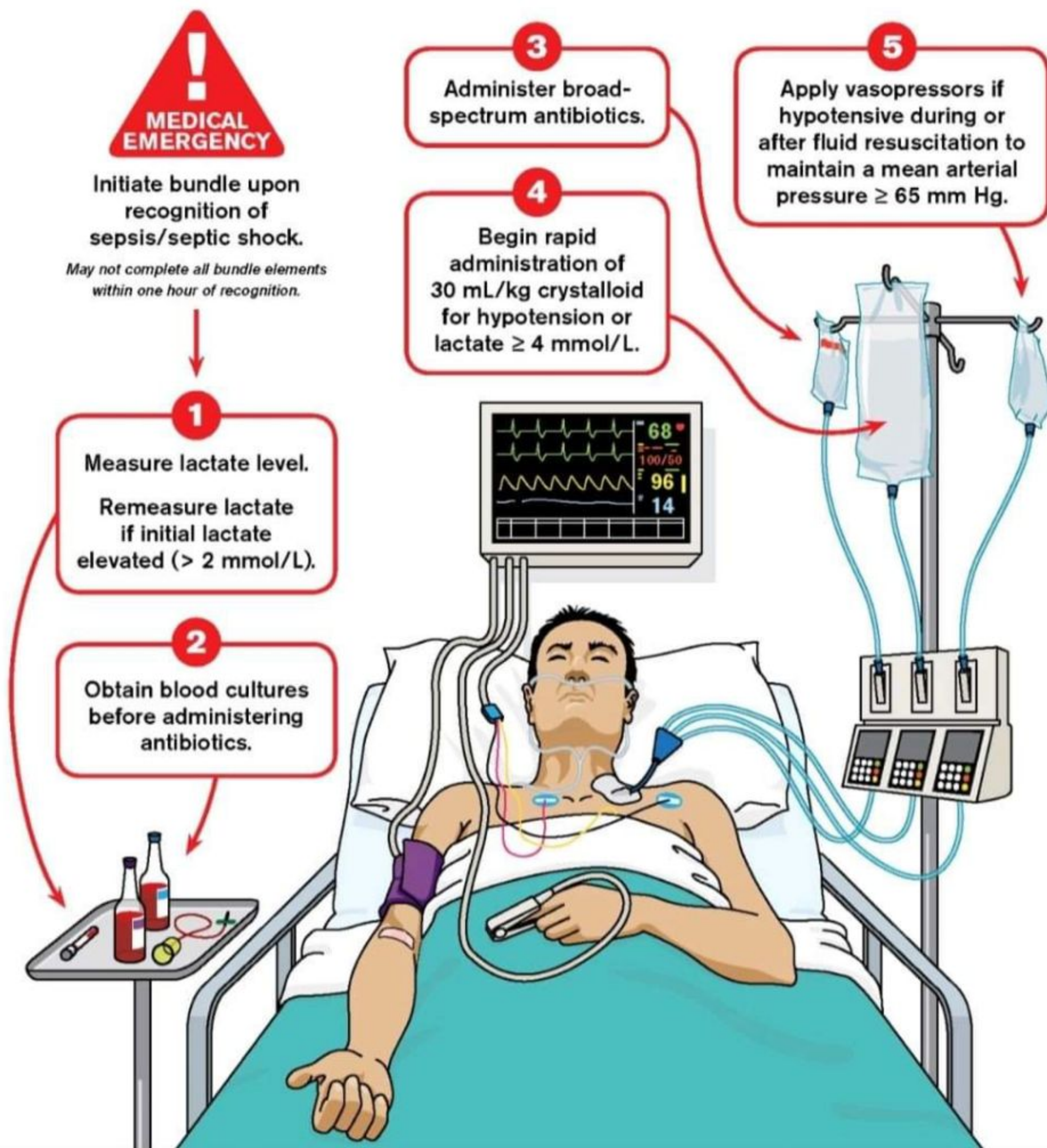
Once preload approaches the flat plateau of the Frank-Starling curve, further fluid boluses will do nothing to improve the stroke volume.



Hour-1 Bundle

Initial Resuscitation for Sepsis and Septic Shock

Surviving Sepsis Campaign



Bundle: [SurvivingSepsis.org/Bundle](https://www.survivingsepsis.org/Bundle)

Complete Guidelines: [SurvivingSepsis.org/Guidelines](https://www.survivingsepsis.org/Guidelines)

نكمل في ال # Sepsis_managment

ووصلنا لل Empirical Antibiotic

اللي رح نعطيها Within the first hour بعد ما نسحب blood culture 2 و culture من مكان ال Infection
يعني لو كان UTI بنسحب مزرعتين blood و مزرعه Urine
لو كان Resp infection بردو رح نسحب مزرعتين blood و sputum culture
لو كان pus بردو نفس الشئ
2 Pus culture and blood culture ...

قبل ما نذكر ال Antibiotics regimen in empiric therapy

رح نخط بعض القواعد ونمشي عليها

١ القاعدة

في خيارين لاختيار ال Regimen of Antibiotic

□ Monotherapy Of Broad spectrum

OR

□ Combination antibiotic

ورح نفصلهم كمان شوي ...

2 القاعدة

طريقه اعطاء المضادات ممكن تكون Intermittent يعني مثلا كل ٨ او كل ١٢ ساعه اعطي الجرعه

وفي Continuous Infusion الجرعه الكليه Infused خلال ال 24hr

The total day dose (say 3 gm) Infused over 24hr

طيب مين افضل ال Intermittent ولا ال Continuous ?

في دراسات كثيره ولسه ما في اشي مثبت ،بس الاغلبه بيأيدو

ال Continuously Infused لانه بيضل تركيز المضاد اعلى من ال

Minimum inhibitory concentration of bacteria killing

3 القاعدة

أول جرعه من ال Antibiotic بنعطيها بجرعه عاليه وغالبا ب

Loading dose

بغض النظر عن وظائف الكلى

والجرعه التانيه بنعدلها حسب ال CrCl او ال GFR

(Tazocin ال Piperacillin-tazobactam ®)

بينعطى

loading dose 4.5 g infused over 30 min ,,and after 4 hr of the loading dose give the next doses according to crcl

والافضل نحسب ال Total dose حسب ال Crcl ونعطيههم ب

وكذلك ال Meropenem نفس الشيء بنعطي اول جرعه 1gm (او 2gm في حالات ال meningitis) وبعد اول جرعه بنعطي الجرعه الثانيه حسب ال crcl

يعني مريض ال crcl لاله 20
بنعطيه 1gm Meropenem ك Loading dose
وبعد 12 ساعه بنعطيه 500 mg
وبنمشيه ع 500mg q12 hr (الجرعه حسب crcl)

او الافضل ع Continuous Infusion بيمشي ع 1gm ع مدار ال 24
من وين جبنا ال 500q 12 hr
من ملف الجرعات حسب ال Crcl

https://t.me/l3lee_afeedk/177

وكذلك ال Vancomycin بنعطي ال Loading dose بس هنا ال loading dose بنعطيه حسب ال crcl بتلاقوه بالرابط ٤

https://t.me/l3lee_afeedk/217

القاعده 4٤

بنضيف Antifungal agent زي ال Fluconazol في الحالات التاليه

when the following risk factors are present: surgery, parenteral nutrition, prolonged antimicrobial treatment or hospitalization (especially in the intensive care unit), chemotherapy, transplant, chronic liver or renal failure, diabetes, major abdominal surgery, vascular devices, septic shock or multisite colonization with Candida spp

القاعده 5 ٤

اول ما تطلع ال Culture بنشوف لو في اشياء نضيفها او مضادات نوقفها
مثلا لو المريض ماشي ع Vancomycin و Meropenem
وطلعت ال Culture ع Acintobacter وماشيه ع Meropenem
بنستمر ع meropenem ونوقف ال Vancomycin
وممكن نضيف مضاد ثاني من ال Culture لجانب ال meropenem

القاعده 6 ٤

مده العلاج غالبا 7-10 ايام الا اذا كان المريض لسه تحسنه بطئ او Neutropenia بنستنى لحد تحسن ال neutrophill count
او لو كان عنده Osteomyelitis او Endocarditis مده العلاج بتستمر لأسابيع

طبيب مدينهم الادويه اللي بتندرج تحت ال

□ Monotherapy Of Broad spectrum :

1□ Meropenem : LOADING dose then maintenance dose according CrCL

2□ Imipenem 500 mg Q6hr or 1gm Q8 hr
Max dose : 4 gm

3□ Piperacillin-tazobactam : LOADING dose then maintenance dose according CrCL

4□ Tigecycline 100 mg as a single dose; Maintenance dose: 50 mg every 12 hours

5□ Moxifloxacin : IV 400 mg every 24 hours

6□ Ampicillin-sulbactam 3g Q6 hr

ولو في بنضيف risk to MRSA infection

Vancomycin start with loading dose or linezolid or daptomycin

كيف بنعرف انه عنده MRSA risk factor ?

لو كان قبل هيك تعرض ل MRSA infection

او البيئه اللي هو فيها عندها prevalence عالي لل MRSA infection
والناس اللي Immunocompromised بيكون عندهم Risk عالي

أما الادويه اللي بتندرج تحت ال

□ Combination antibiotic

Metronidazol + one of the following agent

1□ Aztreonam : 2 g every 6 to 8 hours

2□ 3rd or 4th generation cephalosporin

3□ levofloxacin 500-750 mg once

4□ Gentamycin : 3 to 5 mg/kg/day (use Ideal or adjusted weight in obese pateint)

5□ Amikacin : 15 to 20 mg/kg/day (use Ideal or adjusted weight in obese pateint) ولو في Risk لل MRSA

بنضيف ال Vancomycin

طيب كيف ممكن اختار ال Empirical antibiotic سواء او Combination ?

في جماعه عملو تجميعه رائعه وسهله لاختيار ال Empirical antibiotic حسب ال Organ اللي فيها Infection (موجوده
بالتفصيل بالصور المرفقه مع البوست)

#لعلي أفيدك ٤

Empirical Antimicrobial Therapy.

1- Empirical therapy for I.V line Infection:-

most Common organism Responsible for I.V line Infection is: Methicillin Sensitive Staph aureus "MSSA" or MRSA, and sometime gram -ve bacilli Involve

Preferred antibiotic: Meropenem or Cefepime (active against MSSA and gram - bacilli)

If there's MRSA Risk: add Vancomycin or linezolid or daptomycin.

2. Empirical therapy for Biliary tract Infection

- Main pathogen : E. coli, Klebsiella, Enterococcus faecalis + anaerobic bacteria.

- Preferred antibiotic: Meropenem OR Imipenem or ampicillin-sulbactam OR piperacillin-tazobactam.

Alternative Regimen: Metronidazole + quinolone OR cefalosporin

3- Empirical therapy For Intrabdominal and pelvic Infection:

most common pathogen "Mixed": aerobic coliform, gram - bacilli, B Fragilis

Preferred antibiotic: Meropenem or Imipenem or ampicillin-sulbactam or piperacillin-Tazobactam

Alternative Regimen: Clindamycin or Metronidazole + 3rd or 4th generation cephalosporin (ceftriaxone, cefotaxime, ceftazidime) OR Aztreonam or levofloxacin or gentamycin or amikacin.

4. Empirical therapy for Urosepsis:

for **community acquired**: levofloxacin or aztreonam or Aminoglycoside + ampicillin

for **nosocomial**: 4th generation cephalosporin "cefepime", piperacillin-Tazobactam meropenem, Imipenem with or without Aminoglycoside is preferred one

5. Sepsis with unknown Source of Infection:

A-) No pseudomonas Risk:

add: Vancomycin + one of the following agent:
Meropenem, Imipenem, Cefipime, 3rd, 4th generation Cefalosporin
piperacillin - Tazobactam or Ticarcillin - clavulanate.

B-) pseudomonas Risk:

add vancomycin + 2 antipseudomonal agent from the following:

1. Ceftazidime: 2gm Q 8hr " adjust the dose according to crel "
2. cefepime : 4- 6 gm Infused over 24 hour
3. Meropenem : 1gm Q 8hr or use Continuous Infusion over 24 hour.
4. Imipenem / cilastatin: 500mg - 1gm Q 6hr
5. piperacillin / Tazobactam: 4.5g Q 6hr or Continuous Infusion over 24hr
6. Ciprofloxacin : 400 mg Q 8hr
7. gentamycin or Amikacin
8. Aztreonam : 2gm Q 6-8 hr

Always refer
to patient &
local
sensitivities!

Gram Positives

Daptomycin † *

Telavancin †

Vancomycin †

Cefepime ♣

Ceftriaxone

Ceftaroline †

Ceftazidime-
avibactam ♣ # \$

Ceftolozone-
tazobactam ♣ ‡

Levofloxacin

Doripenem ♣ ‡

Imipenem ♣ ‡

Meropenem ♣ ‡

Moxifloxacin

Piperacillin-
Tazobactam ♣

Linezolid † *

Clindamycin

Gram Negatives

Aztreonam ♣

Aminoglycosides ♣

Ciprofloxacin

Colistimethate ♣ \$

Anaerobes

Metronidazole

MORE...

Critical Care Antibiotic Guide

pharmacyjoe.com

Additional Coverage vs.

♣ Pseudomonas

ESBL

† MRSA

* VRE

\$ KPC

Empiric abx selection: pharmacyjoe.com/episode8

CRRP abx dosing: pharmacyjoe.com/episode13

TABLE 137-5 Empiric Antimicrobial Regimens in Sepsis

Infection (Site or Type)	Antimicrobial Regimen	
	Community-Acquired	Hospital-Acquired
Urinary tract	Ceftriaxone or ciprofloxacin/levofloxacin	Ceftriaxone/ceftazidime or ciprofloxacin/levofloxacin
Respiratory tract	Levofloxacin ^a /moxifloxacin or ceftriaxone + clarithromycin/azithromycin	Piperacillin/tazobactam or ceftazidime or cefepime or carbapenem ^b + levofloxacin/ciprofloxacin or aminoglycoside
		± vancomycin or linezolid
Intra-abdominal	Ertapenem or ciprofloxacin/levofloxacin + metronidazole or Ceftriaxone + metronidazole	Carbapenem ^b or Piperacillin/tazobactam or Ceftazidime/cefepime + metronidazole
Skin/soft tissue	Vancomycin or linezolid or daptomycin	Vancomycin + piperacillin/tazobactam
Catheter-related		Vancomycin
Unknown	Piperacillin/tazobactam or carbapenem ^b	Carbapenem ^b

^a750 mg once daily.^bImipenem, meropenem, and doripenem.

يسعد مساكم ٤٤

لو بدأنا نتعامل مع مريض ال Sepsis ومشينا ع ال sepsis bundle
واخذ المريض Fluid 30 ml/kg وبدأ ع Antibiotic
ومع ذلك لساته Hypotensive وال MAP أقل من 65
وبنسبيه بهلحاله □ Refractory Hypotension □

او بسيناريو ثاني مريض sepsis واعطيناه اول bolus من ال fluid

وراقبناه ولاحظنا إنه بده يدخل ب pulmonary edema لانه مثلا مريض
...Heart fauler
وما بنقدر نكملة ال Resuscitation

شو بنعمل بهاي الحالات ٤٤؟

بهادي الحالات بنعطي المريض Vasopressor

طيب شو هم ال Vasoactive Agent اللي عنا ؟
□ (Noradrenaline □ (NAD -1

بيشتغل ع ال Alpha 1 receptor الموجوده بال blood vessel ويعمل (V.C) Vasoconstriction لل vessel

فبتزيد ال Resistance وبالتالي بيرتفع الضغط ..

وبردو بيشغل ال B1 receptor الموجوده بال heart وبيزود ال Contractility لكت شغله ع B1 يعتبر minimal عشان هيك
بنخاف من حصول bradycardia

ف شغل ال NAD ع ال vessel اكر من شغله ع ال Heart
فلو شغله ع ال vessel بنعطيه 3+ ،فشغله ع ال heart بنعطيه 2+

Adrenaline -2

نفس ميكانزم ال NAD بيشغل ع ال alpha1 وع B1

بس شغله ع القلب اكر (3+) اما ع ال vessel فأقل (2+)

ففرصة انه يعمل Tachycardia اعلى ...

Phenylephrine -3

هاد الدوا عبارده عن Pure alpha agonist يعني شغله بس ع ال vessel بيعملها VC ويرفع الضغط
وبما انه ما يشتغل ع ال heart □ فبنتوقع انه اقل واحد بيعمل .. Tachyarrythmia

4- Vasopressin

بيشتغل ع V1Receptor الموجود بال blood vessel ويعمل VC
فبيزيد الضغط

بس مشكلته انو بالجرعات العاليه ممكن يعمل
Cardiac ,Digital ,Sphalenic Ischemia

5-dopamine

الدوبامين قصته قصه ٤٤ يشغل حسب جرعه :

1. □ Low-dose: 1 to 5 mcg/kg/minute, results in increased renal blood flow and urine output

على ال D receptor

□ Note: The use of low-dose dopamine to prevent or treat acute kidney injury is not recommended □

2. □ Intermediate-dose: 5 to 10 mcg/kg/minute, results in increased renal blood flow, heart rate, cardiac contractility, and cardiac output

يشغل ع B receptor

3. □ High-dose: >10 mcg/kg/minute, alpha-adrenergic effects begin to predominate, resulting in vasoconstriction, increased blood pressure, in addition to increased heart rate, cardiac contractility, and cardiac output due to beta-adrenergic effects.

6- Dobutamine

has minimal alpha 1 action and strong beta 1 and fair beta 2 with no direct effect on vascular tone so mostly it produces hypotension

هدول هم ال Vasoactive Agent

طبيب هال المريض ال Sepsis وما استجاب ع ال Fluid او ما بقدر اعطيه fluid وبدنا نرفعه ال MAP □ مين هو ال Agent اللي استخدمه من اللي ذكرناهم ؟ :

□ □ NAD is the First Line agent used in Refractory septic shock □ □

Initial dose : 5 to 15 mcg/minute (0.05 to 0.15 mcg/kg/minute)

Usual maintenance dose range
2 to 80 mcg/minute (0.025 to 1 mcg/kg/minute)

Range of maximum doses used in refractory shock
(80 to 250 mcg/minute (1 to 3.3 mcg/kg/minute

يبقى ال NAD هو ال 1st choice إلا في الحالات الاتيه :

□ □ Refractort Septic shock associated with Tachyarrythmia Or high CO with hypotension □ □

في هادي الحاله ما بنستخدم ال NAD لانه عنده arrhythmia

□ Phenylephrine □ هو ال First choice ال بهادي الحاله

وجرعات ال Phenylephrine

1. □ Initial dose : 100 to 180 mcg/minute until stabilized (alternatively, 0.5 to 2 mcg/kg/minute)

2. □ Usual maintenance dose range :
20 to 80 mcg/minute (0.25 to 1.1 mcg/kg/minute)

3. □ Maxiumum dose :
80 to 360 mcg/minute (1.1 to 6 mcg/kg/minute);

□Doses >6 mcg/kg/minute do not increase efficacy according to product information in the USA□

□□□Refractory septic shock associated with
Compromised systolic function or Absolute/Relative bradycardia with low risk of tachyarrhythmia

في هادي الحاله □ Dopamine □ هو ال First choice

وجرعاته كالتالي :

1□Initial : 2 to 5 mcg/kg/minute

2□Maintenance : 5 to 20 mcg/kg/minute

3□Maxiumum dose : 20 to >50 mcg/kg/minute يبقى نرجع نجمعهم مريض Refractory sepsis ورح نعطييه

Vasopressor

اول خيار هو ال NAD ما لم يكن عنده احد الحالات السابقه □□

طبيب مريض اخذ NAD وال MAP وارتفع ل 65

هنا عندي خيارين

الخيار الاول □ اما بكمل ع ال NAD لحاله

الخيار الثاني □ بقلل جرعه ال NAD وبيضيف Vasopressin بجرعه 0.03unit/min عشان نقلل من المشاكل اللي ممكن يعملها
ال NAD

طبيب فرضا المريض مشى ع NAD والضغط لساته أقل من 65 ?

بهاي الحاله بنضيف Vasopressin بجرعه 0.03unit/kg

طبيب لو برده لسه ال MAP ما وصل ل 65 رغم ال NAD وال Vasopressin □

بنضيف epinephrine بجرعه 20-50Mcg/min

ولو لسه ما وصلنا لل Target □ بنضيف phenylephrine بجرعه 200-300mcg/min

متى بنستخدم ال Doputamine ?

Dobutamine is indicated if there is evidence of tissue hypoperfusion (central venous oxygen saturation [ScvO₂] < 70 mm Hg) after CVP, MAP, and hematocrit goals have been met

بينضاف مع ال vasopressor اللي موجود

تم بحمد الله

#لعلي_أفيدك □□

https://t.me/l3lee_afeedk/290

Vasoactive agents in septic shock

Drug	Effect on heart rate	Effect on contractility	Arterial constriction effects
Dobutamine	+	+++	- (dilates)
Dopamine	++	++	++
Epinephrine	+++	+++	++
Norepinephrine	++	++	+++
Phenylephrine	0	0	+++

Vasopressors and inotropes in treatment of acute hypotensive states and shock: Adult dose and selected characteristics

Agent	United States trade name	Initial dose	Usual maintenance dose range	Range of maximum doses used in refractory shock	Role in therapy and selected characteristics
Vasopressors (alpha-1 adrenergic)					
Norepinephrine (noradrenaline)	Levophed	5 to 15 mcg/minute (0.05 to 0.15 mcg/kg/minute) Cardiogenic shock: 0.05 mcg/kg/minute	2 to 80 mcg/minute (0.025 to 1 mcg/kg/minute) Cardiogenic shock: 0.05 to 0.4 mcg/kg/minute	80 to 250 mcg/minute (1 to 3.3 mcg/kg/minute)	- Initial vasopressor of choice in septic, cardiogenic, and hypovolemic shock. - Wide range of doses utilized clinically. - Must be diluted; eg, a usual concentration is 4 mg in 250 mL of D5W or NS (16 micrograms/mL).
Epinephrine (adrenaline)	Adrenalin	1 to 15 mcg/minute (0.01 to 0.2 mcg/kg/minute)	1 to 40 mcg/minute (0.01 to 0.5 mcg/kg/minute)	40 to 160 mcg/minute (0.5 to 2 mcg/kg/minute)	- Initial vasopressor of choice in anaphylactic shock. - Typically an add-on agent to norepinephrine in septic shock when an additional agent is required to raise MAP to target and occasionally an alternative first-line agent if norepinephrine is contraindicated. - Increases heart rate; may induce tachyarrhythmias and ischemia. - For inotropy, doses in the higher end of the suggested range is needed - Elevates lactate concentrations during initial administration (ie, may preclude use of lactate clearance goal); may decrease mesenteric perfusion. - Must be diluted; eg, a usual concentration is 1 mg in 250 mL D5W (4 micrograms/mL).

Phenylephrine	Neo-Synephrine, Vazculep	100 to 180 mcg/minute until stabilized (alternatively, 0.5 to 2 mcg/kg/minute)	20 to 80 mcg/minute (0.25 to 1.1 mcg/kg/minute)	80 to 360 mcg/minute (1.1 to 6 mcg/kg/minute); Doses >6 mcg/kg/minute do not increase efficacy according to product information in the United States	■ Pure alpha-adrenergic vasoconstrictor. ■ Initial vasopressor when tachyarrhythmias preclude use of norepinephrine. ■ Alternative vasopressor for patients with septic shock who: (1) develop tachyarrhythmias on norepinephrine, epinephrine, or dopamine, (2) have persistent shock despite use of two or more vasopressor/inotropic agents including vasopressin (salvage therapy), or (3) high cardiac output with persistent hypotension. ■ May decrease stroke volume and cardiac output in patients with cardiac dysfunction. ■ May be given as bolus dose of 50 to 100 mcg to support blood pressure during rapid sequence intubation. ■ Must be diluted; eg, a usual concentration is 10 mg in 250 mL D5W or NS (40 mcg/mL).
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Dopamine	Inotropin	2 to 5 mcg/kg/minute	5 to 20 mcg/kg/minute	20 to >50 mcg/kg/minute	■ An alternative to norepinephrine in septic shock in highly selected patients (eg, with compromised systolic function or absolute or relative bradycardia and a low risk of tachyarrhythmias). ■ More adverse effects (eg, tachycardia, arrhythmias particularly at doses ≥ 20 mcg/kg/minute) and less effective than norepinephrine for reversing hypotension in septic shock. ■ Lower doses (eg, 1 to 3 mcg/kg/minute) should not be used for renal protective effect and can cause hypotension during weaning. ■ Must be diluted; eg, a usual concentration is 400 mg in 250 mL D5W (1.6 mg/mL); use of a commercially available pre-diluted solution is preferred.
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Antidiuretic hormone

Vasopressin (arginine-vasopressin)	Pitressin, Vasopressin	0.03 units per minute (alternatively 0.01 to 0.03 units/minute initially)	0.03 to 0.04 units per minute (not titrated)	0.04 to 0.07 units/minute; Doses >0.04 units/minute can cause cardiac ischemia and should be reserved for salvage therapy	■ Add-on to norepinephrine to raise blood pressure to target MAP or decrease norepinephrine requirement. Not recommended as a replacement for a first-line vasopressor. ■ Pure vasoconstrictor; may decrease stroke volume and cardiac output in myocardial dysfunction or precipitate ischemia in coronary artery disease. ■ Must be diluted; eg, a usual concentration is 25 units in 250 mL D5W or NS (0.1 units/mL).
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Inotrope (beta ₁ adrenergic)					
Dobutamine	Dobutrex	0.5 to 1 mcg/kg/minute (alternatively, 2.5 mcg/kg/minute in more severe cardiac decompensation)	2 to 20 mcg/kg/minute	20 to 40 mcg/kg/minute; Doses >20 mcg/kg/minute are not recommended in heart failure and should be reserved for salvage therapy	- Initial agent of choice in cardiogenic shock with low cardiac output and maintained blood pressure. - Add-on to norepinephrine for cardiac output augmentation in septic shock with myocardial dysfunction (eg, in elevated left ventricular filling pressures and adequate MAP) or ongoing hypoperfusion despite adequate intravascular volume and use of vasopressor agents. - Increases cardiac contractility and rate; may cause hypotension and tachyarrhythmias. - Must be diluted; a usual concentration is 250 mg in 500 mL D5W or NS (0.5 mg/mL); use of a commercially available pre-diluted solution is preferred.
Inotrope (nonadrenergic, PDE ₃ inhibitor)					
Milrinone	Primacor	Optional loading dose: 50 mcg/kg over 10 minutes (usually not given)	0.125 to 0.75 mcg/kg/minute		- Alternative for short-term cardiac output augmentation to maintain organ perfusion in cardiogenic shock refractory to other agents. - Increases cardiac contractility and modestly increases heart rate at high doses; may cause peripheral vasodilation, hypotension, and/or ventricular arrhythmia. - Renally cleared; dose adjustment in renal impairment needed. - Must be diluted; eg, a usual concentration is 40 mg in 200 mL D5W (200 micrograms/mL); use of a commercially available pre-diluted solution is preferred.

- All doses shown are for intravenous (IV) administration in adult patients. The initial doses shown in this table may differ from those recommended in immediate post-cardiac arrest management (ie, advanced cardiac life support). For details, refer to the UpToDate topic review of post-cardiac arrest management in adults, section on hemodynamic considerations.
- Vasopressors can cause life-threatening hypotension and hypertension, dysrhythmias, and myocardial ischemia. They should be administered by use of an infusion pump adjusted by clinicians trained and experienced in dose titration of intravenous vasopressors using continuous noninvasive electronic monitoring of blood pressure, heart rate, rhythm, and function. Hypovolemia should be corrected prior to the institution of vasopressor therapy. Reduce infusion rate gradually; avoid sudden discontinuation.
- Vasopressors can cause severe local tissue ischemia; central line administration is preferred. When a patient does not have a central venous catheter, vasopressors can be temporarily administered in a low concentration through an appropriately positioned peripheral venous catheter (ie, in a large vein) for less than 24 hours. The examples of concentrations shown in this table are useful for peripheral (short-term) or central line administration. Closely monitor catheter site throughout infusion to avoid extravasation injury. In event of extravasation, prompt local infiltration of an antidote (eg, phentolamine) may be useful for limiting tissue ischemia. Stop infusion and refer to extravasation management protocol.
- Vasopressor infusions are high-risk medications requiring caution to prevent a medication error and patient harm. To reduce the risk of making a medication error, we suggest that centers have available protocols that include steps on how to prepare and administer vasopressor infusions using a limited number of standardized concentrations. Examples of concentrations and other detail are based on recommendations used at experienced centers; protocols can vary by institution.

Vasopressor Use for Adult Septic Shock (with guidance for steroid administration)

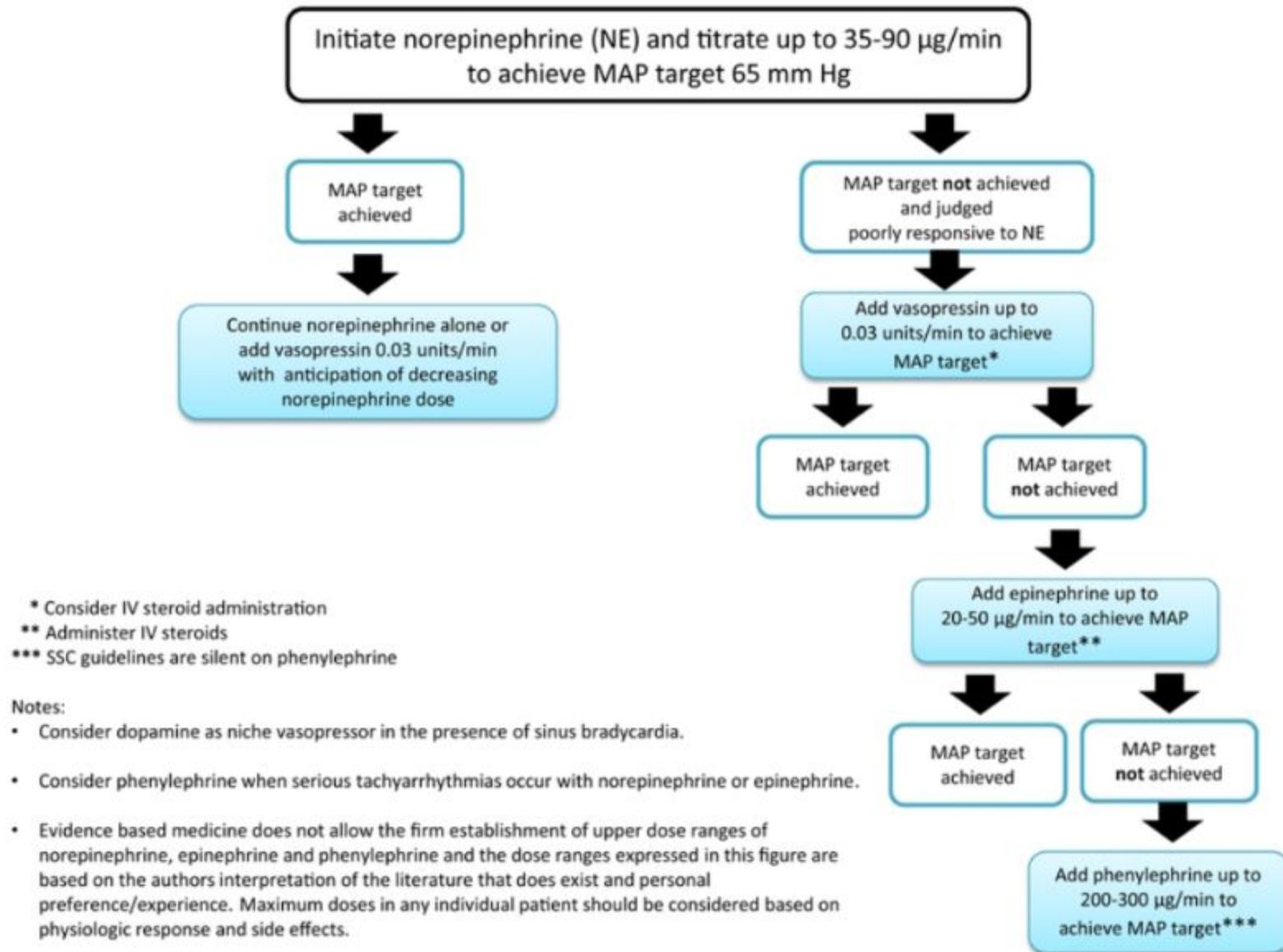


Fig. 3 This figure demonstrates how the guideline recommendations on vasopressor and steroid use can be molded into a flow diagram approach to the management of septic shock

جمعه مبارکه

وصلنا لآخر بوست مع ال Sepsis ☺

Adjuvant Therapy In sepsis

: ☐Hydrocortison

متى بنلجأ لاستخدام ال Hydrocortison للمريض Septic shock?

لو بدأنا معه ال Fluid Resuscitation و Vasopressor

والمريض ما استجاب و ضل Refractory Hypotension

بـهـلـحـالـة بنضيف ☐ Hydrocortisone 200mg/day

في تجميعه لأهم ال Recommendation لاستخدام الكورتيزون بحالات ال Septic Shock

1☐☐Glucocorticoids — Guidelines recommend against the routine use of glucocorticoids in patients with sepsis. However, corticosteroid therapy is appropriate in patients with septic shock that is refractory to adequate fluid resuscitation and vasopressor administration.

2☐☐We typically administer 200 to 300 mg per day of hydrocortisone intravenously in divided doses (50 mg every six hours or 100 mg every eight hours).

3☐☐We typically administer five to seven days of therapy and have a tapered approach to withdrawal that is guided by the clinical response (eg, taper quickly following vasopressor withdrawal)). Close observation of those patients whose steroid therapy is stopped without being tapered is warranted.

☐This practice is consistent with SCCM/EISCM guidelines who recommend <400 mg/day for ≥3 days

تاني حاجه لل adjuvant therapy

☐ strss ulcer prophylaxis

أي مريض Sepsis او Septic shock وعنده Risk لل GIT bleeding

لازم ياخذ اما PPI او H2blocker

فممكن نستخدم omeprazol او مشتقاته

او ال Famotidin

☐Note if the pateint is taking Clopidogrel ,dont use Omeprazol ,You can Use Pantoprazol or Famotidin

طبيب زي شو Risk factor اللي ممكن تدخل المريض GIT bleeding?

1☐pateint Who require Mechanical ventillation for more than 48 hr

2☐INR more than 1.5

واخر شي معنا لل adjuvant therapy

C Venous Thromboembolism prophylaxis

فبنعطي Enoxaparin او LMWH زي ال unfractionated Heparin

بعض الدراسات بتنصح باستخدام ال LMWH وبتعتبرها افضل من ال Unfractionated Heparin واكل بال Mortality

وبهيك بنكون وصلنا لآخر جزء من ال Sepsis

#لعللي أفيدك ؟

Principles: If suspected infection, screen for sepsis. If hypotensive, shocked or increased lactate, commence fluid and vasopressor resuscitation

Priority

Immediate

Ongoing

Recognise

Screen for Sepsis using local screening tool:

- qSOFA/SOFA
- NEWS
- SEPSIS KILLS

Suspected or confirmed infection

Assess organ function

- Heart rate
- Blood pressure
- Arterial oxygen saturation
- Respiratory rate
- Mental status
- Serum lactate

Monitor haemodynamic and organ function

- Heart rate
- Blood pressure
- Arterial oxygen saturation
- Respiratory rate
- Mental status
- Temperature
- Urine output
- Serum Lactate

Other supportive therapies as required

Mechanical Ventilation

- Lung protective ventilation strategy (see text)

Renal Replacement Therapy

- If indicated for fluid overload or metabolic derangement, (severe uraemia, hyperkalemia, acidosis) (see text)

Nutrition

- Commence enteral feeding early (see Table 2)

Glucose control

- Maintain blood glucose < 10 mmol/L (see Table 2)

Venous Thromboembolism Prophylaxis

- unfractionated heparin or low-molecular-weight heparin (see Table 2)

Blood Transfusion

- If Hb < 70 g/L (see Table 2)

Minimise sedation

Early mobilisation when stabilised

Resuscitate

(if haemodynamic instability or increased lactate)

All within 1 hour

1st

Obtain blood cultures

- All patients
- Prior to first dose antibiotic
- Two sets, aerobic and anaerobic

2nd

Administer antibiotics

- All patients
- Broad spectrum
- Follow local guidelines for empiric therapy

Measure Lactate

- To determine illness severity / diagnose septic shock

Administer intravenous crystalloids

- Normal saline or buffered salt solution
- Up to 30 ml/kg over 3 hours
- Albumin, if failure to respond to crystalloid
- (NEVER administer hydroxyethyl starch)

Commence Vasopressors

- MAP target 65 mmHg
- Noradrenaline, first line
- Vasopressin/epinephrine if needed

Administer intravenous corticosteroids

- Consider 200 mg hydrocortisone per day if hypotension / shock persists > 4 hours despite fluid resuscitation and vasopressor support

SEPSIS

